CONTRIBUTIONS TO THE NATURAL HISTORY OF THE COMMANDER ISLANDS.

XI. THE CRANIUM OF PALLAS'S CORMORANT.

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In 1882 Dr. Leonhard Stejneger[1] obtained from a natural bone deposit on Bering Island a small number of bones of Pallas's Cormorant, *Phalacrocorax perspicillatus*. During the summer of 1895 Dr. Stejneger again visited Bering Island and obtained from the same deposit a second lot of bones, the most important of which were a cranium and sternum.

The cranium (No. 19417, U.S.N.M.), or, strictly speaking, the calvarium, in its general contour most closely resembles that of *P. penicillatus* among existing cormorants, but is decidedly larger, and is proportionately wider than in that species, while the beak is shorter. As far as mere size is concerned, the skull of an adult male of *P. carbo* would be as long as that of *P. perspicillatus*, but the latter is much wider and is more depressed. The cranium is readily distinguished from that of *P. urile* by its greater size and less depression, and by having a proportionately stouter beak, whose ridge lacks the slight but characteristic emargination found near the base of the beak in *P. urile*.

As a matter of fact, the differentiation of cormorants into species with grooved beaks and those without does not exist, so far as the bony beak is concerned. Some have deeper grooves than others, but all have more or less of a furrow along the side of the mandible, and there is every degree of gradation, from such well-furrowed beaks as those of *P. albiventris* and *P. magellanicus* to the shallow grooves of *P. melanoleucus* and *P. carbo*.

[1] Proc. U. S. Nat. Mus., XVII, 1889, pp. 83–94.

Pallas's Cormorant shows a marked difference from all others examined in the development of the lateral ethmoid. In other species the lachrymal sends a process inward which fuses with a spur from the mesethmoid to form a more or less L-shaped bar of bone, uniting the frontal and mesethmoid. A small spur, arising from the inferior inner angle thus formed, represents the lateral ethmoid, and this is usually but little developed, being largest in *P. penicillatus* and obsolete in *P. urile*. In *P. perspicillatus* there is a lateral ethmoid plate, complete save for an opening above, being the retention by ossification of a cartilaginous plate found in the nestling of *P. urile* before the nostrils have become closed. The maxillopalatines are also slightly better developed than in any existing cormorant, and while the difference is small, still it does exist, and here again it is seen by comparison to be the development of a character found in young birds.

Differences exist between *P. perspicillatus* and other cormorants by the presence of a narrow bar of bone forming two precranial cavities where but a single opening exists in allied species, and in the comparatively small size and regular lyrate form of these openings. From these conditions it will be seen that there is in the cranium an excess of ossification over that found in other cormorants. While no bar of bone has been found in other species, there are hints of it in some, thus, *P. penicillatus* and *P. magellanicus*, in the shape of a little bony spike running upward from the alisphenoids, and it is not impossible that the complete bar may be found in some very old individual. This is the more probable because in the young, of *P. urile* at least, there is a bar of cartilage occupying the place of the bar of bone found in Pallas's Cormorant.

The sternum (No. 19417, U.S.N.M.) found with the present series of bones is important, as its size indicates it to be that of a male, and shows the sternum previously described to have been that of a female, or possibly even that of a male of *P. urile*. It is very much larger than any sternum of *P. urile*, and much larger even than the large specimen of *P. carbo*, used for comparison.[1] The present sternum is thus in harmony with the other bones, and aids materially in emphasizing the superior size of *P. perspicillatus*.

The appended tables give the measurements of the cranium and sternum here described, compared with the corresponding parts of other species. The measurements of the previously described sternum, ascribed to *P. perspicillatus*, are repeated and an error of the first-given table corrected. The length from anterior end of carina to end of mesoxiphoid is said to be 104 mm., when it should have been 90 mm.

Unfortunately the skull of *P. carbo* now available is smaller than that of the individual used as a term of comparison in the previous paper[2] on Pallas's Cormorant.

[1] Proc. U. S. Nat. Mus., XII, 1889, pp. 88–94.

[2] Loc. cit.

Measurements[1] *of species of Phalacrocorax.*[2]

STERNUM.

	P. perspicillatus, male (U.S.N.M., No. 19417).	*P. carbo*, male (Yale College, No. 535).	*P. penicillatus* (U.S.N.M., No. 18535).	*P. urile*, male (U.S.N.M., No. 12502).
	mm.	*mm.*	*mm.*	*mm.*
Anterior end of carina to mesoxiphoid	[3] 132	119	101	104
Manubrium to mesoxiphoid	109	97	87	90
Depth of carina	[3] 40	33	22	25
Width across articulations of first rib.	84	66	60	70
Width across articulations of fourth rib	72	59	58	65

SKULL.

	P. perspicillatus, male (U.S.N.M., No. 19417).	*P. carbo*, male (U.S.N.M., No. 18851).	*P penicillatus* (U.S.N.M., No. 940).	*P. urile*, male (U.S.N.M., No. 12502).
	mm.	*mm.*	*mm.*	*mm.*
Tip of mandible to occipital condyle	[4] 148	135	141	116
Fronto-nasal hinge to articulation for occipital style	69	61	62	55
Across anterior part of frontals	22	20	19	13
Across postorbital processes	39	31	32	25
Across squamosal processes	45	36	37	32
Across exoccipital processes	40	33	33	26

[1] The measurements are in a straight line.

[2] Proc. U. S. Nat. Mus., XII, 1889, p. 88.

[3] Estimated, owing to breakage.

[4] Taken from rostrum of one bird and calvarium of another.

EXPLANATION OF PLATES.

PLATE XXXIV.

[All figures natural size.]

Fig. 1. *Phalacrocorax perspicillatus*, inferior aspect of cranium. The anterior and posterior portions are from different individuals.

2. *Phalacrocorax perspicillatus*, left ramus of jaw, external aspect

3. *Phalacrocorax perspicillatus*, mandible and left palatine.

PLATE XXXV.

[Two-thirds natural size.]

Fig. 1. *Phalacrocorax penicillatus.*

2. *Phalacrocorax perspicillatus.*

3. *Phalacrocorax carbo.*